

ABSTRACT OF THE DISCLOSURE

[39] The electromigration and stress migration of Cu interconnects is significantly reduced by forming a composite capping layer comprising a layer of β -Ta on the upper surface of the inlaid Cu, a layer of tantalum nitride on the β -Ta layer and a layer of α -Ta on the tantalum nitride layer. Embodiments include forming a recess in an upper surface of Cu inlaid in a dielectric layer, depositing a layer of β -Ta at a thickness of 25 \AA to 40 \AA , depositing a layer of tantalum nitride at a thickness of 20 \AA to 100 \AA and then depositing a layer of α -Ta at a thickness of 200 \AA to 500 \AA . Embodiments further include forming an overlying dielectric layer, forming an opening therein, e.g., a via opening or a dual damascene opening, lining the opening with α -Ta, and filling the opening with Cu in electrical contact with the underlying inlaid Cu.

WDC99 735110-1.050432.0614